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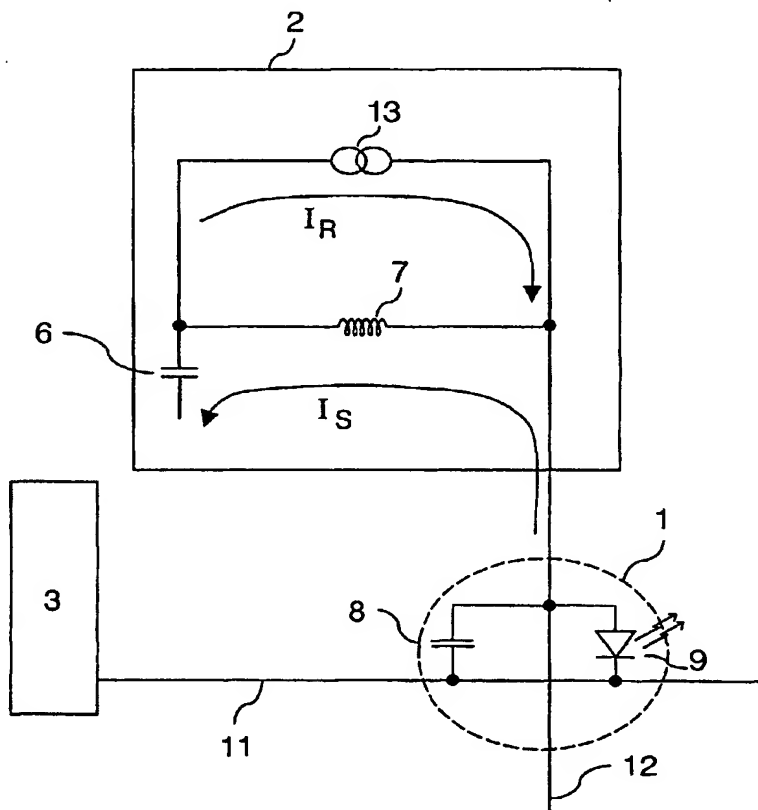
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[Continued on next page]

(54) Title: MATRIX DISPLAY DEVICE WITH ENERGY RECOVERY CIRCUIT



(57) Abstract: Matrix display device having row electrodes (11) and column electrodes (12) an intersection of a row and a column electrode defining a pixel cell (1) having a pixel cell capacitance (8), and drive circuits (2,3). Blind energy used for charging the pixel cell capacitances (8) when driving the pixel cells (1) is not dissipated but stored into a buffer capacitor (6) through an inductor (7) forming a series inductor-capacitor circuit and subsequently recovered by discharging the buffer capacitor (6) into the pixel cell capacitances (8) through a current source (13). Energy recovery is thus current driven, which allows to control the light reflected or emitted by the pixel cell (1) in a manner which is less dependent on temperature variations and/or ageing of the device.



ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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B. FIELDS SEARCHED

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/030633 A1 (VAN VELZEN JEROEN) 18 October 2001 (2001-10-18) paragraphs '0005!-'0007!,'0021!; figures 1,2 ---	1,6,7
X	US 6 404 012 B1 (TAKAHASHI KENICHIRO) 11 June 2002 (2002-06-11) column 21, line 1-column 23, line 32; figure 12 ---	1,5,7
A	US 2002/036605 A1 (KAWASHIMA SHINGO) 28 March 2002 (2002-03-28) abstract; figure 2 --- -/--	1,7

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"ENERGY RECOVERY METHOD FOR A LIQUID CRYSTAL DISPLAY SOURCE DRIVER" IBM TECHNICAL DISCLOSURE BULLETIN, IBM CORP. NEW YORK, US, vol. 40, no. 8, 1 August 1997 (1997-08-01), pages 191-192, XP000735627 ISSN: 0018-8689 the whole document -----	1,7

INTERNATIONAL SEARCH REPORT

International Publication No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 2001030633	A1	18-10-2001	CN 1363079 T	07-08-2002
			WO 0163586 A1	30-08-2001
			EP 1188159 A1	20-03-2002
			JP 2003524214 T	12-08-2003
US 6404012	B1	11-06-2002	JP 3142057 B2	07-03-2001
			JP 11204792 A	30-07-1999
			CN 1218299 A	02-06-1999
			TW 402821 B	21-08-2000
US 2002036605	A1	28-03-2002	JP 2002108284 A	10-04-2002
			TW 511067 B	21-11-2002